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Characterizing Laminar Flame Interactions with Turbulent Fluidic Jets and Solid Obstacles for Turbulence Induction.[1] JESSICA CHAMBERS, STEPHEN GERDTS, KAREEM AHMED, Propulsion and Energy Laboratory of Central Florida — A detonation engine's fundamental design concept focuses on enhancing the Deflagration to Detonation Transition (DDT), the process through which subsonic flames accelerate to form a spontaneous detonation wave. Flame acceleration is driven by turbulent interactions that expand the reaction zone and induce mixing of products and reactants. Turbulence in a duct can be generated using solid obstructions, fluidic obstacles, duct angle changes, and wall skin friction. Solid obstacles have been previously explored and offer repeatable turbulence induction at the cost of pressure losses and additional system weight. Fluidic jet obstacles are a novel technique that provide advantages such as the ability to be throttled, allowing for active control of combustion modes. The scope of the present work is to expand the experimental database of varying parameters such as main flow and jet equivalence ratios, fluidic momentum ratios, and solid obstacle blockage ratios. Schlieren flow visualization and particle image velocimetry (PIV) are employed to investigate turbulent flame dynamics throughout the interaction. Optimum conditions that lead to flame acceleration for both solid and fluidic obstacles will be determined.

[1]American Chemical Society

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